

pressure ratios. Therefore, when undesirable pressure conditions are encountered, seal assembly 84 will be forced downward breaking seal 126, thereby permitting fluid flow from the discharge pressure zone of compressor 10 to the suction pressure zone of compressor 10. If this flow is great enough, the resultant loss of flow of motor-cooling suction gas (aggravated by the excessive temperature of the leaking discharge gas) will cause a motor protector to trip thereby the de-energizing motor. The width of seal 126 is chose so that the unit pressure between sealing lip 118 and the seat portion of partition 22 is greater than normally encountered discharge pressure, thus ensuring consistent sealing.

[0023] The scroll compressor as thus far broadly described is either now known in the art or is the subject of other pending applications for patent or patents of Applicant's Assignee.

[0024] The present invention is directed towards a retention system for a normally open mechanical valve assembly 130, which is disposed within recess 78, which is formed in non-orbiting scroll member 70. While the present invention is being described in conjunction with normally open mechanical valve assembly 130, the retention system of the present invention can be used with any other type of discharge valve also. Valve assembly 130 moves between a first or closed condition, a second or open condition, and a third or fully open condition during steady state operation of compressor 10. Valve assembly 130 will close during the shut down of compressor 10. When valve assembly 130 is fully closed, the recompression volume is minimized and the reverse flow of discharge gas through scroll members 56 and 70 is prohibited. Valve assembly

130 is normally open as shown in Figures 3 and 4A. The normally open configuration for valve assembly 130 eliminates the force required to open valve assembly 130 as well as eliminating any mechanical device needed to close valve assembly 130. Valve assembly 130 relies on gas pressure differential for closing.

[0025] Referring now to Figures 3-5, discharge valve assembly 130 is disposed within recess 78 and it comprises a valve seat 132, a valve plate 134, a valve stop 136 and a wave ring retainer 138. Valve seat 132 is a flat metal disc shaped member defining a discharge passage 140, a pair of alignment apertures 142 and a cavity 144. Non-orbiting scroll member 70 defines a pair of alignment bores. When apertures 142 are in registry with the alignment bores, discharge passage 140 is aligned with discharge passage 76. The shape of discharge passage 140 is the same as discharge passage 76. The thickness of valve seat 132, particularly in the area of cavity 144 is minimized to minimize the recompression volume for compressor 10, which increases the performance of compressor 10. The bottom surface of cavity 144 adjacent to valve plate 134 includes a contoured surface 148. The flat horizontal upper surface of valve seat 132 is used to secure valve plate 134 around its entire circumference. Contoured surface 148 of cavity 144 provides for the normally open characteristic of valve assembly 130. Contoured surface 148 may be a generally planar surface as shown in Figure 4A or contoured surface 148 may be a curved surface. While cavity 144 and contoured surface 148 are shown as a pocket within valve seat 132, it is within the scope of the present invention to have cavity 144 and

thus surface 148 extend through the edge of valve seat 132. Also, it is within the scope of the present invention to eliminate valve seat 132 and incorporate cavity 144 and surface 148 directly into and onto non-orbiting scroll 70 if desired.

[0026] Valve plate 134 is a flat thin metal disc shaped member that includes an annular ring 150, a generally rectangular portion 152 extending radially inward from ring 150 and a generally circular portion 154 attached to the radial inner end of rectangular portion 152. Rectangular portion 152 is designed to be smaller in width than circular portion 154. This reduced section therefore has a lower bending load than circular portion 154, which results in a faster opening of valve assembly 130. This reduced section of rectangular portion 152 is acceptable from a durability standpoint since contoured surface 148 reduces the stress loading on this reduced section. The size and shape of portion 154 is designed to completely cover discharge passage 140 of valve seat 132. The generally circular shape of portion 154 eliminates valve breakage that is associated with rectangular valve plates. In general, valve plates can have a tendency to twist during the closing of the valve due to the pressure fluctuations across the valve. When a rectangular shape valve twists before closing, the outside corner of the rectangle will hit first causing high loading and the breakage of the corner. The present invention, by using a generally circular portion to close the valve, eliminates the possibility of this corner breakage. Valve plate 134 also includes a pair of bosses 156, which define a pair of alignment apertures 158. When apertures 158 are in registry with apertures 142 of valve seat 132, rectangular portion 152 positions circular portion 154 in alignment with

pressure within the central most fluid pocket formed by scroll members 56 and 70. During operation of compressor 10, the fluid pressure differential between fluid in discharge chamber 80 and fluid within the central most fluid pocket formed by scroll members 56 and 70 will move valve plate 134 between abutment with contoured surface 148 of valve seat 132 and abutment with valve stop 136 or between a first closed position and a second open position. The normally open position of valve assembly 130 eliminates the force that is required to open a typical discharge valve. The elimination of this force lowers the pressure differential for operating the valve, which, in turn, lowers power losses. In addition the normally open feature reduces the sound generated during the closing of the valve due to the gradual closing of the valve rather than the sudden closure of a normally closed valve. Contoured surface 148 provides for this gradual closing feature. The valve of the present invention operates solely on pressure differentials. Finally, the unique design for valve assembly 130 provides a large flow area to improve the flow characteristics of the system.

[0031] When valve plate 134 is in its second or open position, additional discharge pressure within discharge passage will react against discharge valve assembly 130 and it will eventually exceed the spring force being applied by wave ring retainer 138. Discharge valve assembly 130 will then move axially upward to the position shown in Figure 4B, the third or fully open position, to allow fluid flow around the outer periphery of discharge valve assembly 130.

[0032] Valve plate 134 is sandwiched between valve seat 132 and valve stop 136 with annular ring 160 of valve stop 136 abutting annular ring 150

